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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* MINEHIRO TONOSAKI, MOTOSUKE OHMI, EISAKU KATO,  
MASAKAZU YAJIMA, and TAKASHI YAJIMA

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Appeal 2009-005609  
Application 10/728,916  
Technology Center 3700

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Decided: February 18, 2010

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Before WILLIAM F. PATE, III, JENNIFER D. BAHR, and  
STEFAN STAICOVICI, *Administrative Patent Judges*.

STAICOVICI, *Administrative Patent Judge*.

DECISION ON APPEAL

## STATEMENT OF THE CASE

Minehiro Tonosaki et al. (Appellants) appeal under 35 U.S.C. § 134 (2002) from the Examiner's decision rejecting claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53. Claims 1-10, 13, 19, 23-24, 33, and 35 have been canceled and claims 17, 18, 20-22, 26, 28, 30, 34, 37, 39, 41-43, 45-47, 50, 52, and 54 have been withdrawn. Appellants' representative presented oral argument on February 4, 2010. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

## THE INVENTION

Appellants' invention relates to a heat transport device 1 including an evaporator 2 where a liquid working fluid evaporates, a condenser 3 where a gaseous working fluid condenses, a liquid line 4 where a liquid-phase working fluid flows, and a gaseous line 5 where a vapor-phase working fluid flows. Spec. 6-7 and fig. 1.

Claim 11, the sole independent claim, is representative of the claimed invention and reads as follows:

11. A micro heat-transport device comprising:
  - a refrigerant;
  - an evaporator formed between a first glass and a first substrate;
  - a condenser formed between a second glass and a second substrate;
  - wherein the first and second substrates are at least one of a glass substrate and a silicon substrate;

a liquid passage linking the evaporator and condenser configured to allow the refrigerant to flow from the condenser to the evaporator;

a gas passage linking the evaporator and condenser configured to allow the refrigerant to flow from the evaporator to the condenser; and

a wick being included in one of the evaporator, the condenser, the liquid passage, or the gas passage, wherein the at least one of first and second glass and/or the at least one of first and second substrate are covered with a stable material selected from the group consisting of SiO<sub>2</sub>, SiN, SiC and a combination thereof formed by at least one of nitriding, oxidation, chemical vapor deposition, ion implantation, and carbonization.

#### THE REJECTIONS

The Examiner relies upon the following as evidence of unpatentability:

Steele	US 5,562,949	Oct. 8, 1996
Uchida	US 5,943,543	Aug. 24, 1999
Kirshberg	US 2003/0066625 A1	Apr. 10, 2003

The following rejections are before us for review:

The Examiner rejected claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, for failing to comply with the written description requirement.

The Examiner rejected claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 under 35 U.S.C. § 103(a) as unpatentable over Kirshberg and Steele or Uchida.

### THE ISSUES

1. Did the Examiner err in concluding that the originally filed application does not support “a first glass and a first substrate” and “a second glass and a second substrate,” as required by independent claim 11?
2. Did the Examiner err in concluding that the combined teachings of Kirshberg and Steele or Uchida would have prompted a person of ordinary skill in the art to apply a silicon dioxide coating as taught by Steele or Uchida to the micro heat-transport device of Kirshberg?

### SUMMARY OF DECISION

We AFFIRM.

### FINDINGS OF FACT

The following enumerated findings of fact (FF) are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Kirshberg discloses a microcapillary pumped loop (micro heat-transport devices) for heat removal from micro-devices including a first silicon substrate 21 and a second glass substrate 22. Kirshberg, p. 1, ¶ [0004] and p. 2, ¶ [0020].
2. The microcapillary pumped loop of Kirshberg includes an evaporator 10, a condenser 12, a vapor line 14, a liquid line 16, a fluid reservoir 18, a reservoir feed line 20, grooves 24 which

form a wicking structure, and grooves 26. Kirshberg, p. 1, ¶¶ [0017]-[0018] and figs. 1 and 2.

3. In use, the wicking structure 24 of Kirshberg transports liquid from reservoir 18 and from liquid line 16 to the evaporator 10 where the liquid is converted to vapor in heat exchange with an external heat generating structure. The vapor is then transferred through vapor line 14 to the condenser 12. Kirshberg, p. 2, ¶ [0021].
4. Uchida discloses enhancing heat transmitting performance by improving wetting of a heat transfer surface by applying to it a silicon dioxide coating. Uchida, col. 7, ll. 4-11.
5. Steele discloses enhancing wetting and increasing surface tension of a heat transfer surface by applying a hydrophilic coating, such as a silica (silicon dioxide) coating. Steele, col. 3, ll. 35-60.
6. Steele further discloses that a hydrophilic coating, such as a silica (silicon dioxide) coating that improves wetting also improves wicking of water flowing over the heat transfer surface. Steele, col. 3, ll. 49-54.

## PRINCIPLES OF LAW

### Written Description

To satisfy the written description requirement, the disclosure must convey with reasonable clarity to skilled artisans that the Appellants were in possession of the claimed invention as of the filing date. *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991). “The invention is, for

purposes of the 'written description' inquiry, *whatever is now claimed*." *Id.* at 1564.

Obviousness

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 550 U.S. at 407 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.")

While there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness, "the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418 (2007).

When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103

likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

*Id.* at 417. We “must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.” *Id.*

## OPINION

### *Issue (1)*

We first consider the Examiner's rejection of claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

Each of claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 requires “a first glass and a first substrate” and “a second glass and a second substrate.” The Examiner takes the position that “[t]he specification discloses [that] the device is composed of only a glass and silicon substrate, not two glass substrates.” Ans. 3. Pointing to Page 7 of the Specification, Appellants argue that the Specification describes “a main body including a plurality of substrates bonded together.” App. Br. 12. *See also*, Reply Br. 3. Appellants further point to Page 4 of the Specification to show that the Specification describes “bonding of the components or substrates where the base material is silicon or glass.” App. Br. 13. Appellants then conclude that because,

[t]he original specification describes a micro heat-transport device having a plurality of glass substrates and therefore inherently/and or



implicitly describes a micro heat-transport device having a “first” glass substrate and a “second” glass substrate.

Reply Br. 3.

In other words, Appellants appear to argue that because the original Specification describes bonding a plurality of substrates where the base material is silicon or glass, then it must follow that the original Specification also describes bonding a “plurality of glass substrates,” *i.e.*, a first glass substrate and a second glass substrate. *See, e.g.*, Reply Br. 3.

We agree with the Examiner that the Specification discloses a device that is composed of only a glass substrate and a silicon substrate. *See* Ans. 3. The Specification conveys with reasonable clarity to a person of ordinary skill in the art only that the claimed micro heat-transport device includes a silicon substrate 9A, 21A, 27A, or 28A and a glass substrate 9B, 21B, 27B, or 28B. *See e.g.*, Spec. 2, ll. 13-14; Spec. 7, ll. 23-24; Spec. 10, ll. 17-20; Spec. 14, ll. 2-3; Spec. 15, ll. 10-11; and figs. 3 and 5-7. Just because Appellants’ Specification describes bonding a plurality of substrates of glass or silicon, we do not find that this by itself, without more, conveys with reasonable clarity to a person of ordinary skill in the art bonding a plurality of glass substrates. To follow Appellants’ logic would mean that the Specification also describes bonding a plurality of silicon substrates. We do not find that Appellants’ Specification conveys with reasonable clarity such embodiments, *i.e.*, bonding a plurality of glass substrates or a plurality of silicon substrates. Rather, the Specification conveys with reasonable clarity only bonding a glass substrate and a silicon substrate. Therefore, the rejection of claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49,

51, and 53 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement, is sustained.

*Issue (2)*

Appellants argue the rejection under 35 U.S.C. § 103(a) of claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 together as a group. App. Br. 3. Therefore, in accordance with 37 C.F.R.

§ 41.37(c)(1)(vii)(2007), we have selected claim 11 as the representative claim to decide the appeal, with claims 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 standing or falling with claim 11.

Appellants argue that the Examiner has failed to provide an explanation why a person of ordinary skill in the art would have been motivated to cover the glass cover of Kirshberg's device with a hydrophilic coating (silicon dioxide/silica), such as that of Uchida or Steele, which covers a metallic heat transfer surface. App. Br. 5-6 and 8-9. Appellants further argue that a person of ordinary skill in the art would not have turned to the teachings of a macro heat-transport device, such as that of Uchida, in order to modify the micro heat-transfer device of Kirshberg. App. Br. 7. Specifically, Appellants note that:

Fluid transport and/or fluid flow occurring on a micro scale is well-recognized to be influenced by factors which play no role or a different role in heat and/or fluid flow occurring on a macro scale. For example, surface tension, energy dissipation, capillary forces, the ability to achieve turbulent flow and fluidic resistance (e.g., non-laminar flow), may each substantially change the rules governing fluid and/or heat flow on a micro scale

in comparison to fluid and/or heat flow on a macro  
(conventional) scale.

*Id.*

At the outset, we note that Appellants' arguments appear to attack the teachings of Kirshberg and Uchida or Steele individually, rather than the combination of Kirshberg and Uchida or Steele. Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

In this case, the microcapillary pumped loop of Kirshberg includes an evaporator 10, a condenser 12, a vapor line 14, a liquid line 16, a fluid reservoir 18, a reservoir feed line 20, grooves 24 which form a wicking structure, and grooves 26. FF 1, 2. Kirshberg further discloses that the wicking structure 24 transports liquid from reservoir 18 and from liquid line 16 to the evaporator 10 where the liquid is converted to vapor in heat exchange (heat transfer) with an external heat generating structure. FF 3. In other words, Kirshberg discloses that the wicking structure 24 of Kirshberg requires heat transfer properties. Uchida discloses that improved heat transmitting performance (heat transfer properties) of a heat transfer surface is the result of improved wetting. FF 4. Furthermore, both Uchida and Steele disclose that a silicon dioxide (silica) coating improves wetting of a heat transfer surface. FF 4, 5. Steele further discloses that an additional benefit of improved wetting of a heat transfer surface is improved wicking. FF 6.

As such, Appellants' claimed micro heat-transport device is nothing more than the microcapillary pumped loop of Kirshberg having a silicon dioxide coating as taught by Uchida. Although we agree with Appellants

that the physics of micro-fluid flow is different from the physics of macro-fluid flow, we find that a person of ordinary skill in the art would have immediately appreciated that providing the silicon dioxide coating of Uchida to the microcapillary pumped loop of Kirshberg, would provide similar benefits, namely, improved wetting, heat transfer, and wicking. Appellants have not presented any evidence to show that the application of a silicon dioxide coating suitable for the microcapillary loop of Kirschberg would have involved any more than routine optimization within the technical grasp of a person of ordinary skill in the art. Modifying the microcapillary pumped loop of Kirshberg to include a silicon dioxide coating would not have been uniquely challenging to a person of ordinary skill in the art, because it is no more than “the mere application of a known technique to a piece of prior art ready for the improvement.” *KSR Int’l. Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Therefore, the modification appears to be the product not of innovation but of ordinary skill and common sense. Moreover, Appellants have not alleged, much less shown, that the modification of Kirshberg to include the silicon dioxide coating of Uchida would have been beyond the skill of a person of ordinary skill in the art.

In conclusion, we agree with the Examiner that it would have been obvious for a person of ordinary skill in the art to provide a silicon dioxide coating to the microcapillary pumped loop of Kirshberg “for the purpose of improving wetting and wicking properties to [thereby] improve heat transfer.” Ans. 4.

Appellants also argue that because the substrate of Uchida is metallic and because glass and metal are different materials, it would not have been obvious to a person of ordinary skill in the art to use the hydrophilic (silicon

dioxide) coating of Uchida to cover the glass substrate of Kirshberg. App. Br. 6. Although we agree with Appellants that metal and glass are different materials, we note that Uchida specifically discloses that a silicon dioxide coating enhances heat transmitting performance by improving wetting of a heat transfer surface. FF 4. Accordingly, a person of ordinary skill in the art would have readily recognized that improved wetting results in a greater contact area between the liquid and the heat transfer area of Kirshberg and Uchida. As such, the same person of ordinary skill in the art would have immediately appreciated that providing a silicon dioxide coating to the microcapillary pumped loop of Kirshberg would provide the same benefit, namely, increased heat transfer contact area due to increased wetting. After all, "[a] person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421.

Lastly, Appellants argue that the purpose of Uchida's silicon dioxide coating is to "cope with corrosion," and not to "lessen contaminant bleed into a refrigerant." App. Br. 6. We find Appellants' argument unpersuasive because if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. *KSR*, 550 U.S. at 417. In determining whether the subject matter of a claim is obvious, "neither the particular motivation nor the avowed purpose of the [applicant] controls. What matters is the objective reach of the claim." If the claim extends to what is obvious, it is unpatentable under § 103. *KSR*, 550 U.S. at 419.

In conclusion, for the foregoing reasons, the rejection of claim 11, and claims 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53

standing or falling with claim 11, is sustained. Because we affirm the rejection based on Kirshberg and Uchida, we need not analyze the alternative combination of Kirshberg and Steele.

### CONCLUSIONS

1. The Examiner has not erred in concluding that the originally filed application does not support “a first glass and a first substrate” and “a second glass and a second substrate,” as required by independent claim 11.
2. The Examiner has not erred in concluding that the combined teachings of Kirshberg and Steele or Uchida would have prompted a person of ordinary skill in the art to apply a silicon dioxide coating as taught by Steele or Uchida to the heat transport device of Kirshberg.

### DECISION

The Examiner’s decision to reject claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, for failing to comply with the written description requirement, is affirmed.

The Examiner’s decision to reject claims 11, 12, 14-16, 25, 27, 29, 31, 32, 36, 38, 40, 44, 48, 49, 51, and 53 under 35 U.S.C. § 103(a) as unpatentable over Kirshberg and Uchida or Steele is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

**AFFIRMED**

Appeal 2009-005609  
Application 10/728,916

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